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The University of Alabama in Huntsville

Final Report

TURBULENCE AND GRAVITY WAVES IN THE TROPICAL UPPER ATMOSPHERE

NASA Grant Number: NAG8-063

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STATEMENT OF PROJECT

The present research project is one of the most important research programs in the Graduate School of the Univesity of Alabama in Huntsville (UAH). This research project has supported two Master's Programs (J. M. Liu and C. C. Lee) and three Doctoral Programs (Y. D. Tsao, C. C. Lee, and K. L. Shyu) in UAH.

This research project has resulted in 3 refereed journal article publications. Lists of journal article publications sponsored by present research projects are as follow:

(1) Hung, R. J., Tsao, Y. D., Johnson, D. L., Chen, A. J., Lin, C. H., Cheng, J. M., and You, C. M., VHF Radar Remote Sensing of Atmospheric Parameters Over Taiwan During the Time Period of Typhoon Wayne, Int. J. Remote Sensing, 9, 477-493, 1988.

(2) Hung, R. J., Tsao, Y. D., Lee, C. C., Johnson, D. L., Chen, A. J., Lin, C. H., and Pan, J. J., Observations on Thermospheric and Mesospheric Density Disturbances Caused by Typhoons and Convective Storms, J. Spacecraft and Rockets, 27, 285-298, 1990.

(3) Hung, R. J., Lee, C. C., and Chen, A. J., Atmospheric Density Remote Sensing of Mesosphere and Thermospher to be Used for Spacecraft Design by Adopting VHF Radar and HF Doppler Sounder at Low Latitude West Pacific Site During Winter Time, Acta Astronautica, 21, 583-597, 1990.

The present research project has also supported 9 conference proceeding papers which were presented at national and international

congress and conferences. Lists of research papers published in the conference proceedings are as follows:

(1) Hung, R. J., Tsao, Y. D., Johnson, D. L., Chen, A. J., and Lin, C. H., VHF Radar Remote Sensing of Vertical Profile of Liquid Water Content and Rainfall Rate Over Taiwan During the Time Period of Typhoon Wayne, Proceedings of the Eighth Asain Conference on Remote Sensing, C-2-1 to C-2-11, 1987.

(2) Hung, R. J., Tsao, Y. D., Johnson, D. L., Chen, A. J., VHF Radar Observation of Middle Atmospheric Gravity Waves Associated with Severe Tropical Storms Over the Western Pacific Area, Middle Atmospheric Dynamics, International Union of Geophysics and Geodesy, Vol. 3, pp. 3-29, Vancouver, Canada, 1987.

(3) Hung, R. J., Tsao, Y. D., Chen, A. J., and Chang, L. N., VHF Radar Remote Sensing of Liquid Water Content During Tropical Storms, Proceedings in Tropical Precipitation Measurements, Published by Science and Technology Corp. VA., pp. 61-70, 1987.

(4) Hung, R. J., Tsao, Y. D., Chen, A. J., and Chang, L. N., VHF Radar Remote Sensing of Rainfall Rate and Vertical Profile of Liquid Water Content Over Taiwan During the Time Period of Typhoon Wayne, Tropical Rainfall Measurements, Ed. by J. S. Theon, and N. Fugono, A. Deepak Publishing, Hampton, VA, pp. 497-510, 1988.

(5) Hung, R. J., Tsao, Y. D., Liu, J. M., Johnson, D. L., Chen, A. J., and Lin, C. H., Lower Thermospheric Density Fluctuations

During the Time Period of Typhoon Dinah, AIAA Paper 89-0854, pp. 13, 1989.

(6) Hung, R. J., Tsao, Y. D., Lee, C. C., Johnson, D. L., Chen, A. J., Lin, C. H., and Pan, C. J., VHF Radar Observations of Mesospheric Density Disturbance Caused by Typhoon Susan and Topical Storms in the Western Pacific Area, AIAA Paper 89-0765, pp. 16, 1989.

(7) Hung, R. J., Tsao, Y. D., Lee, C. C., Johnson, D. L., and Chen, A. J., Atmospheric Density Remote Sensing of Mesosphere and Thermosphere to be Used for Spacecraft Design by Adopting VHF Radar and HF Doppler at Low Latitude West Pacific Site During the Time Passage of Severe Tropical Storms, Proceedings of 40th International Astronautical Congress, IAF Paper, 89-181, pp. 12, 1989.

(8) Hung, R. J., Lee, C. C., Gao, M., Yang, F. W., Johnson, D. L., and Chen, A. J., HF Doppler and VHF Radar Observations of Upper Atmospheric Disturbances Caused by Weak Cold Front During Winter Time, AIAA Paper 90-0483, pp. 12, 1990.

(9) Hung, R. J., Lee, C. C., Johnson, D. L., and Chen, A. J., Remote Sensing of Mesospheric and Thermospheric Density Perturbations Induced by Subtropical Heavy Rainfalls for Spacecraft Environment Study, AIAA Paper, No. 91-0455, pp. 11, 1991.

The journal articles published are attached in this final report to illustrate our research activity which have been supported by this research project.

Journal Artical Published (1)

Hung, R. J., Tsao, Y. D., Johnson, D. L., Chen, A. J., Lin, C. H., Cheng, J. M., and You, C. M., VHF Radar Remote Sensing of Atmospheric Parameters Over Taiwan During the Time Period of Typhoon Wayne, Int. J. Remote Sensing, 9, 477-493, 1988.